

Solving the Mystery: How Did Dioxins Get Into Animal Feed? Investigations of Dioxin Formation in Mineral Feed Supplements

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Dioxins discovered in animal feed ingredients during a random sampling by Irish officials in 2002 were traced to mineral supplements produced at a Minnesota plant in the United States. Dioxins and dioxin-like substances, such as furans, are ubiquitous environmental contaminants and are known to be toxic at low levels. These feed supplements provide trace minerals (in a polysaccharide complex) necessary for the animals' health. The products were voluntarily recalled by the company until the source of dioxins could be identified and the dioxins eliminated from the supplements.

Preliminary investigations by the company and federal agencies indicated that the dioxins were apparently produced during the manufacturing process of one or more supplements containing copper, zinc, manganese, magnesium, and iron. Analysis showed that each of the mineral supplements had some dioxin contamination, but levels were higher in the copper supplement, so we focused on that product.

In cooperation with company scientists, our Environmental Chemistry Lab obtained the ingredients and the details of the production process from the manufacturer and analyzed both ingredients and process. The ingredients were found to be free of dioxins/furans at sub parts-per-trillion (ppt) levels, while a sample of the product itself contained dioxins or furans at approximately 1300 ppt (toxic equivalency).

We then simulated the production process in the laboratory and successfully produced a product containing dioxins/furans at similar concentrations, with a virtually identical isomer distribution to that found in the manufactured product. Additional studies helped us to identify the ingredients required for dioxin formation and provided further insight into the conditions necessary for their production.

The studies and simulation process revealed that dioxin production can be avoided if manufacturers limit dehydration of the sample and control the temperatures used in the production process. These process changes have been made and the resulting supplements are no longer contaminated with dioxins.

Illustrations: Animals at trough; table of dioxins and furans (possibly with explanation of toxic equivalency); picture representing how dioxins are created in a manufacturing process.